Dietary fiber intake in the US population[1,2]

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ABSTRACT Twenty-four hour recall data from adults interviewed in the Second National Health and Nutrition Examination Survey, NHANES II, were used as the basis to estimate total dietary fiber intake in the United States. Food fiber values were calculated for the 2500 foods in NHANES II in two ways: *1*) using fiber values compiled from the literature by NCI and *2*) values based on the Southgate methodology. Mean dietary fiber intake in the US adult population (> 19 y of age) is 11.1 g/d using the first set of values and 13.3 g/d according to Southgate values. On a per 1000 kcal basis, women consume more dietary fiber (6.5 g/1000 kcal) than men (5.5 g/1000 kcal) at every age. Fiber intake by geographic region, age, race, and sex is discussed. Our study indicates that dietary fiber intake in the United States is considerably lower than that previously reported. *Am J Clin Nutr* 1987;46:790–7.

KEY WORDS Dietary fiber, nutrient intakes

Introduction

The hypothesis that dietary fiber (DF) is protective against diabetes, heart disease, obesity, colon cancer, and many other large bowel disorders is being discussed widely in the scientific literature (1–4). One of the factors that hinders the interpretation of epidemiologic studies in this field is the inadequacy of the data on dietary fiber intake of populations. This is due in part to difficulties involved with the analysis of dietary fiber. Although numerous methods have been utilized (5, 6), only recently has an Association of Official Analytical Chemists (AOAC) method for total dietary fiber received approval (7). The inherent difficulties with DF analysis and the only recent approval granted the AOAC method have severely limited the amount of reliable data on the dietary fiber content of foods. In addition much of the literature on dietary fiber intake is either based on limited segments of the population such as college students (8) or healthy white-collar worker volunteers (9) or assessed using food disappearance data (10), which do not account for losses due to consumer wastes.

Data on the dietary fiber intake of the US population is especially meager. Because US food tables only list crude-fiber values, recent national surveys have not estimated dietary fiber intake. By utilizing the provisional fiber table of Lanza and Butrum (5) and data from the most recent National Health and Nutrition Examination Survey (11), we have estimated the dietary fiber intake of the US adult population. We have compared our results with other DF estimates in the literature and provide basic descriptive data on DF intake in population subgroups.

Methods

Data from the Second National Health and Nutrition Examination Survey (NHANES II) (11) conducted from 1976–80 was used to estimate dietary fiber intakes in this study. The major purpose of the NHANES II was to continue the monitoring of a broad range of morbidity data and related health information with a specific focus on the nutritional status of the US population. The survey is a probability sample of the entire civilian noninstitutionalized population of the United States for persons aged 6 mo–74 y. To gather this probability sample, the United States was split up into a large number of continuous geographic areas called primary sampling units (PSUs). The population characteristics of each PSU, such as size and race distribution (based on projections of the US Bureau of the Census), were examined before the sample was designed. Several of the densely populated PSUs, usually coincident with the Census Bureau's Standard Metropolitan Statistical Areas (SMSAs), were designated as certainty PSUs, which means they were sampled with probability 1.0 for NHANES II. The remaining areas were sampled roughly proportionate to population size with enough distribution to generalize data to a wide variety of demographic classifications. Within each sampled PSU, smaller areas were sampled. For example, in an urban area census tracts might be a subsequent sampling stage, followed by sampling of blocks, and then finally sampling a cluster of households in a block.

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TABLE 1
Provisional dietary fiber table*

Food	Analytical method†	Fiber
		g/100 g
Fruits		
Apple (w/o skin)	2, 3, 4	2.1
Apple (w/skin)	2	2.5
Apricot (fresh)	2, 3	1.7
Apricot (dried)	6	8.1
Banana	2, 4	2.1
Blueberries	2	2.7
Cantaloupe	3	1.0
Cherries, sweet	2, 3	1.2
Dates	3, 4	7.6
Grapefruit	2, 3, 4	1.3
Grapes	3, 4	1.3
Oranges	2, 4	2.0
Peach (w/skin)	4	2.1
Peach (w/o skin)	2, 3	1.4
Pear (w/skin)	4	2.8
Pear (w/o skin)	2, 3, 4	2.3
Pineapple	2, 3	1.4
Plums, damsons	2, 4	1.7
Prunes	3, 4	11.9
Raisins	3, 4	8.7
Raspberries	3, 4	5.1
Strawberries	2, 3	2.0
Watermelon	2	0.3
Juices		
Apple	2	0.3
Grapefruit	2	0.4
Grape	2	0.5
Orange	2	0.4
Papaya	2	0.6
Vegetables		
Cooked		
Asparagus, cut	2, 3	1.5
Beans, string, green	2, 3, 4	2.6
Broccoli	2, 4	2.8
Brussels sprouts	2, 3	3.0
Cabbage, red	4	2.0
Cabbage, white	4	2.0
Carrots	2, 3, 4	3.0
Cauliflower	3, 4	1.7
Corn, canned	2, 3	2.8
Kale leaves	3	2.6
Parsnip	3, 4	3.5
Peas	2, 3, 4	4.5
Potato (w/o skin)	3, 4	1.0
Potato (w/skin)	4	1.7
Spinach	2, 4	2.3
Squash, summer	2, 4	1.6
Sweet potatoes	2, 3	2.4
Turnip	3, 4	2.2
Zucchini	4	2.0
Raw		
Bean sprout, soy	3	2.6
Celery, diced	3, 4	1.5
Cucumber	3, 4	0.8
Lettuce, sliced	3, 4	1.5
Mushrooms, sliced	3	2.5
Onions, sliced	3, 4	1.3
Peppers, green, sliced	3, 4	1.3
Tomato	3, 4	1.5
Spinach	2	4.0
Legumes		
Baked beans, tomato sauce	3	7.3
Dried peas, cooked	3, 4	4.7
Kidney beans, cooked	3	7.9
Lima beans, cooked/canned	2	5.4
Lentils, cooked	3	3.7
Navy beans, cooked	6, 3	6.3
Breads, pastas, and flours		
Bagels	1	1.1
Bran muffins	1	6.3
Cracked wheat	1	4.1
Crisp bread, rye	1	14.9
Crisp bread, wheat	1	12.9
French bread	1	2.0
Italian bread	1	1.0
Mixed grain	1	3.7
Oatmeal	1	2.2
Pita bread (5")	1	0.9
Pumpernickel bread	1	3.2
Raisin bread	1	2.2
White bread	1, 4, 5	2.2
Whole wheat bread	1, 4	5.7
Pasta and rice—cooked		
Macaroni	1, 5	0.8
Rice, brown	3, 5	1.2
Rice, polished	1, 4, 5	0.3
Spaghetti (regular)	1, 5	0.8
Spaghetti (whole wheat)	1, 5	2.8
Flours and grains		
Bran, corn	4	62.2
Bran, oat	3	27.8
Bran, wheat	1, 3, 4, 5	41.2
Rolled oats	4, 5	5.7
Rye flour (72%)	4	4.5
Rye flour (100%)	4	12.8
Wheat flour:		
wholemeal (100%)	3, 4	8.9
brown (85%)	3, 4	7.3
white (72%)	3, 4	2.9
Nuts		
Almonds	4	7.2
Peanuts	3	8.1
Filberts	3	6.0

* Dietary fiber values are averages compiled from literature sources. Users of this table are advised to read reference (5) to fully understand the derivation and meaning of these values.

† The numbers in this column refer to the analytical method used to obtain the mean dietary fiber value. The method and a reference describing the method are as follows: *1*) Neutral detergent fiber (16); *2*) Neutral detergent fiber plus water soluble fraction such as (17); *3*) Southgate procedure (18); *4*) Total dietary fiber procedure (7, 19–24); and *5*) Englyst, nonstarch polysaccharide (NSP) (25).

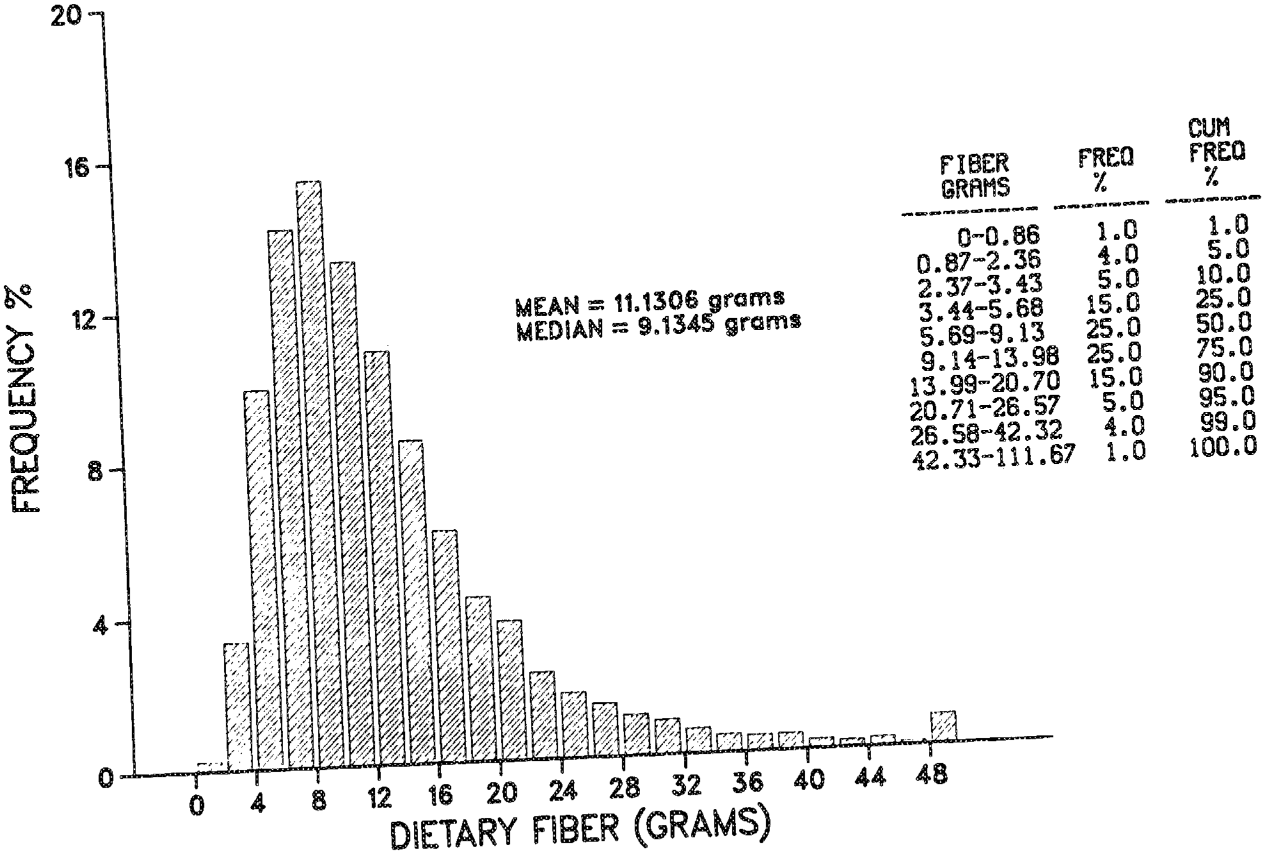

FIG 1. Frequency distribution of adult US dietary fiber intake.

The sampling stages often were stratified to ensure selection of areas with specific demographic characteristics. This stratification and clustering in the sample design represent a departure from well-known simple random sampling. A description of the sampling and data collection procedures employed are documented in a Vital and Health Statistics publication (12). This study uses NHANES II 24-h dietary recall data from 11 658 adults aged ≥ 19 y. Only dietary data that was considered adequately assessed by the interviewer was included. A person's recall was considered unsatisfactory if the person refused to cooperate, was not available at the time of the interview, and could not recall two major meals or if there was incomplete 24-h recall data regarding types or amounts of food for the total day. Of the 20 322 individuals (adults and children) examined in NHANES II, only 1.11% had unsatisfactory 24-h recalls (13).

TABLE 2
Comparison of mean dietary fiber values for the NHANES II adult population from estimates based on the Lanza and Butrum (5) and the Southgate (28) tables

	Southgate		Lanza and Butrum	
	Median	Mean	Median	Mean
All (n = 11658)	11.1	13.3	9.1	11.1
Females (n = 6149)	9.6	11.1	8.1	9.4
Males (n = 5509)	12.9	15.7	10.4	12.9

In the NHANES II survey, trained personnel (minimum qualifications were a Bachelor's degree in nutrition and most were registered dietitians experienced in dietary interviewing) collected 24-h dietary recall information covering the day before the interview. More than 50 three-dimensional food portion models were used to assist in estimating amounts consumed. Detailed instructions followed by the interviewers to obtain accurate dietary data are documented in a National Center for Health Statistics (NCHS) publication (14). The foods reported

TABLE 3
Comparison of dietary fiber values of Southgate (28) and Lanza and Butrum (5)

	Southgate	Lanza and Butrum
	g/100 g	
White flour	3.7	2.9
White bread	2.7	1.6
Cornflakes	11.0	1.1
Rice Krispies®	4.5	0.2
Yellow corn	4.7	2.8
Potatoes	2.0	1.0
Peas	7.9	4.5
Bananas	3.4	2.4
Blackberries	7.3	3.8
Almonds	14.3	7.2

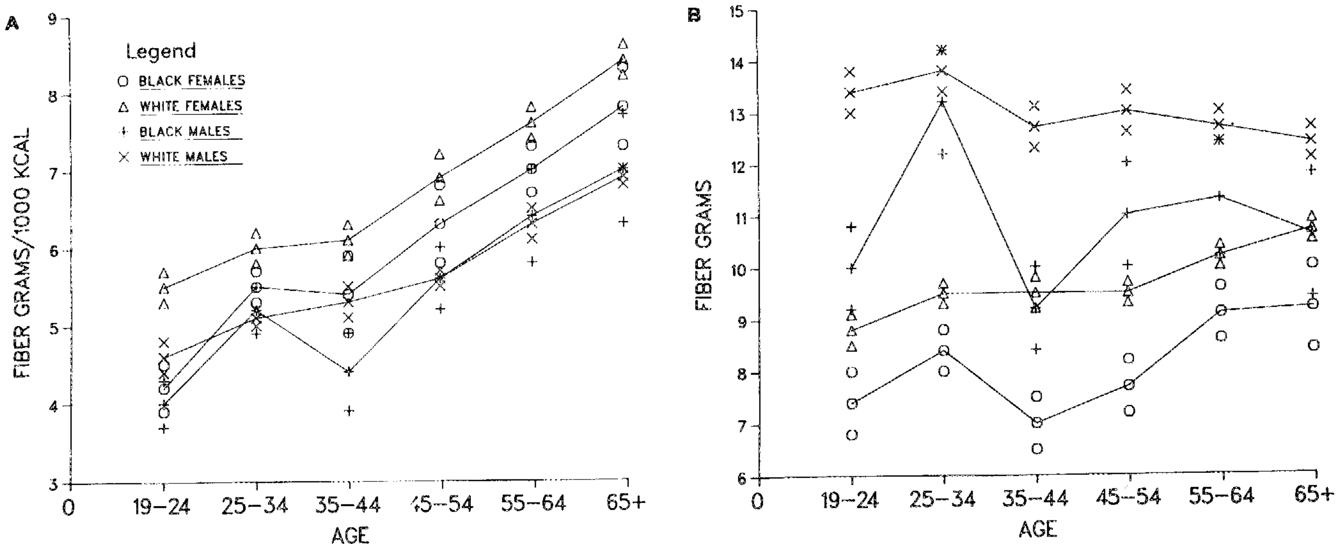

FIG 2. Dietary fiber intake by age, sex, and race. *A:* g/1000 kcal (Mean ± SEM); *B:* g (Mean ± SEM).

in the 24-h dietary recall were coded by the interviewers for analysis based heavily on the US Department of Agriculture (USDA) Handbook #8 (15) nutrient information. Because dietary fiber values do not appear in this publication, the dietary fiber table of Lanza and Butrum (5) was used to derive most of the fiber values needed for this study. This table was compiled from an extensive evaluation of literature reports and provides values obtained from several different analytic procedures for total dietary fiber for 126 food items. The dietary fiber values for a selected number of foods from that table are given in **Table 1**. Values were considered adequate for inclusion into the table if they were analyzed by one of the following methods: *1*) neutral detergent fiber (NDF), if the food contained no water-soluble fibers (16) (this procedure was acceptable only for grain products, excluding oats); *2*) neutral detergent fiber plus a measure of the water-soluble fraction (17); *3*) Southgate procedure (18); and *4*) various total dietary fiber procedures including the methods of Theander (19, 20), Furda (21), Schweizer and Wursch (22), Prosky (7), and Englyst (23, 24).

For most of the 2244 different food items reported by adults in NHANES II, dietary fiber values were extrapolated after correction for moisture changes with standard types of food table calculations (15). For many of the items cited in NHANES II, DF values were calculated from recipes according to the calculations of Marsh (26) for mixed dishes and Tressler and Sultan (27) for baked products. To compare these DF estimates with commonly reported values for dietary fiber derived using the Southgate analytic procedures, the entire process of assigning DF values was repeated for all 2244 foods with the most recent UK food tables (28). For foods not listed in the UK tables, values were imputed as described above.

Statistical analyses, based on data appropriately weighted to reflect the survey sample design, were carried out using the software program, SAS (29). Student's t tests were utilized for basic comparisons. Although DF data are skewed, this test is robust with respect to nonnormality. When more than two groups were compared, regression techniques were employed. Variance calculations appropriate for complex sample surveys were obtained using the software, SESUDAAN (30) and SURREGR (31).

Results

The distribution of DF intake in the adult US population is given in **Figure 1**. On any given day, 50% of the US population reports a DF intake of < 10 g/d and only ~10% consume > 20 g/d. The mean daily intake of fiber among US adults is 11.1 g.

The contrast in fiber intakes derived from DF estimates based on Lanza and Butrum values (5) and those based on Southgate values (28) is shown in **Table 2**. This comparison was made because the majority of studies to date have used only Southgate fiber values, which are markedly higher than those in reference (5) for some common high-starch foods (**Table 3**). Because of this difference, the 1–

TABLE 4
Dietary fiber intake by education, sex, and race

	Fiber (g) Mean (SEM)			Fiber (g/1000 kcal) Mean (SEM)		
	< High school	High school	> High school	< High school	High school	> High school
Black females	7.9 (0.3)	7.8 (0.3)	8.6 (0.5)	6.0 (0.2)	5.5 (0.4)	5.7 (0.3)
White females	9.1 (0.2)	9.3 (0.2)	10.4 (0.3)	6.7 (0.1)	6.3 (0.2)	6.8 (0.2)
Black males	10.2 (0.8)	10.5 (0.9)	13.1 (0.8)	5.4 (0.3)	4.5 (0.4)	5.6 (0.3)
White males	13.2 (0.5)	12.9 (0.3)	13.2 (0.2)	5.9 (0.2)	5.1 (0.1)	5.5 (0.1)
Total	10.7 (0.2)	10.7 (0.2)	11.8 (0.1)	6.2 (0.1)	5.8 (0.1)	6.1 (0.1)

TABLE 5
Mean dietary fiber intake by urban vs rural residence, race, and sex

	Mean fiber (g) (SEM)		Mean fiber (g/1000 kcal) (SEM)	
	Urban	Rural	Urban	Rural
Black females	8.0 (0.3)	8.4 (0.6)	5.7 (0.2)	6.0 (0.4)
White females	9.6 (0.2)	9.6 (0.2)	6.6 (0.1)	6.6 (0.1)
Black males	11.4 (0.4)	8.4 (0.6)	5.3 (0.2)	4.6 (0.3)
White males	12.9 (0.2)	13.5 (0.4)	5.5 (0.1)	5.5 (0.1)
Total	10.9 (0.1)	11.5 (0.2)	6.0 (0.1)	6.0 (0.1)

3 g higher DF intakes in every age and sex category for the Southgate estimates were not unexpected.

Dietary fiber intake in various subgroups of the US population is shown in **Figure 2** and **Tables 4–7.** It is apparent from Figure 2*A* that males and females exhibit the same pattern of increasing DF intake with age when fiber is examined in relation to total caloric intake. Females consistently chose more fiber-dense diets than males. The mean values for females across all ages are 6.6 g/1000 kcal for white females and 5.6 g/1000 kcal for black females. For males, the mean values across all ages are 5.2 g/1000 kcal for black males and 5.5 g/1000 kcal for white males. Similar patterns across age were seen in both blacks and whites, although the considerably smaller sample sizes in blacks make their estimates more variable. A marked racial effect is evident in Figure 2*A*, with blacks having lower DF intakes than whites in both sexes across all age groups.

Although females have greater relative fiber intake (grams of DF/1000 kcal), Figure 2*B* shows that males eat greater absolute amounts of dietary fiber at all ages. This is due to their greater overall food intake compared with females. The mean values for males across all ages are 11.0 g for black males and 13.1 g for white males. For females the means are 8.0 and 9.6 g for black and white women, respectively. In Figure 2*B*, as in Figure 2*A*, the smaller sample size for blacks causes more variable estimates. If both sexes were pooled, very little difference with age would be apparent in total gram intake of DF. This is because almost completely inverse patterns with age are seen in the sexes. Females show their lowest intake in the younger years and intake slowly rises to the highest values at the oldest ages, whereas males show highest intake at 25–34 y and then intake decreases to lowest values at the oldest ages.

Because of the marked sex and race differences and the relatively smaller age effect, all the subsequent demographic analyses are presented for the four sex-race groups pooled across all ages. This allows cross-classification by groups with major differences while avoiding the problems of unstable estimates associated with small cell size.

Significant regional differences are not evident in Table 4 for the pooled sample either in total fiber intake or intake per 1000 kcal. For the total sample, the West has highest absolute DF intake as well as the most fiber-dense diets. However, varying patterns are seen within the race groups. Blacks of both sexes have their lowest DF intakes in the West and highest DF intakes in the Northeast.

Slight increases in dietary fiber intake among the total sample of rural residents as compared with urban residents are seen in Table 5. This difference disappears completely in whites when caloric intake is considered. Higher fiber intake still is evident for black females even after considering caloric intake. Black males show decreased absolute and relative fiber intake in rural versus urban residents.

The effect of income on DF intake is shown in Table 6. Income is represented by the poverty-index ratio (PIR), a measure of income adjusted for family size and other factors. A PIR of ≤ 1.0 indicates a relative income at or below the poverty level. Although a significantly lower DF intake is seen in the lower-income group, this disappears when caloric intake is considered. Compared with females, males have an inverse pattern, showing higher absolute and relative fiber intakes in the lower-income group. Racial differences persist within the two income groups and are of greater magnitude than any income differences.

Discussion

This study provides the first estimate of dietary fiber intake in the US population from a cross-sectional national survey. The mean intake of 11.1 g/d of DF reported here is lower than most previous estimates (Table 7). In comparing our results with other estimates it is important to consider the types of errors associated with nutrient-intake measurements. The error can be divided into two main parts: error due to the nutrient composition data and error in dietary-assessment methodology. Faulty analytical methods and imputing unknown values constitute recognized sources of errors in food composition data (36). The dietary fiber values used in this study were compiled from literature sources (5) representing a variety of acceptable analytical procedures for quantitating dietary fiber (37). Because the values in this table were never previously used for estimating fiber intake, the entire NHANES II data was reevaluated using Southgate (28) values. The mean increased ~20% (11.1–13.3 g/d of DF). This increase was not unexpected because the DF data in

TABLE 6
Mean dietary fiber intake by poverty-index ratio (PIR), race, and sex

	Fiber (g) (SEM)		Fiber (g/1000 kcal) (SEM)	
	PIR ≤ 1.0	PIR ≥ 1.0	PIR ≤ 1.0	PIR ≥ 1.0
Black females	7.8 (0.4)	8.0 (0.3)	5.4 (0.2)	5.8 (0.3)
White females	9.1 (0.3)	9.7 (0.1)	6.4 (0.2)	6.6 (0.1)
Black males	11.3 (0.7)	11.0 (0.4)	5.4 (0.4)	5.2 (0.2)
White males	13.6 (1.0)	13.1 (0.2)	5.7 (0.3)	5.5 (0.1)
Total	10.3 (0.4)	11.2 (0.1)*	5.9 (0.1)	6.0 (0.1)

* Significantly lower than higher income group, $p < 0.05$.

TABLE 7
Comparison of dietary fiber (DF) intake of the US population

Population	Mean DF (g)/d	Mean DF/1000 kcal	Method of assessment	Reference
United States	11.2	6.0	Representative national survey	Lanza et al, 1987
United States	19.1	7.2	Selected diet Southgate	Ahrens, 1978 (32)
College	15.4	9.6	Food record Southgate	Marlett, 1981 (8)
United States	27	NA*	Disappearance Southgate	Bingham and Cummings, 1980 (33)
United States	22.8	NA*	Disappearance Southgate	Bright-See, 1985 (34)
New York City	12	5.1	Food record Southgate	Reddy et al, 1980 (35)
New York City	14–15	5.9	Food record Southgate	Reddy et al, 1983 (9)

* NA = not available.

the Paul and Southgate food composition table (28) tend to be higher than those obtained with other recent methods (38). The colorimetric methods used are not specific and inhibit cross interference, and the tables include some values obtained with an indirect method in which unavailable carbohydrates (DF) were measured by difference in the alcohol-insoluble residue after enzymatic removal of starch (39). The last reason for the overestimation of dietary fiber values is that the fiber residues were not adjusted for starch contamination (40). Because all other fiber intakes in Table 7 were based on Southgate values, this could be one of the reasons for our lower estimates.

The lack of a large data base for DF required calculation of many food items according to their formulation. Although this practice can lead to errors, it is quite common and difficult to avoid (36), especially in the United States where a large variety of processed foods is present in our food supply.

There are a number of errors often associated with dietary-assessment methodology (41, 42), including sampling variation, estimating usual intake, and variation in reporting and recording data. Just by chance persons randomly selected in dietary surveys may not be representative of the reference population, which can lead to both systemic bias and random error (36). The statistically selected sample in NHANES II as described in the methodology section has made this national survey one of the cornerstones of the US National Nutrition Monitoring System because its sample size is large and it is designed to provide data representative of the entire population (43). Dietary intake of volunteers may be quite different from those of an appropriately sampled population (44), which might be another reason for the lower values in our study.

TABLE 8
Contributions of major food groups (% kcal) to dietary intake at different ages

Food group	Age in years					
	19–24	25–34	35–44	45–54	55–64	65+
	% kcal	*% kcal*	*% kcal*	*% kcal*	*% kcal*	*% kcal*
Milk, eggs	15	13	14	14	16	16
Meats	17	18	19	19	17	16
Fats, oils	6	7	7	8	8	9
Legumes, nuts, seeds	2	2	2	2	2	2
Cereals, grains	15	15	16	17	18	20
Fruits, vegetables	10	11	11	11	13	15
Other	35	34	32	30	26	23

Our study is the only one listed in Table 7 that used 24-h recalls to estimate dietary intake. A large part of the error in 24-h recalls is due to systematic and extraneous measurement errors, which can be kept to manageable levels by employing well-trained interviewers and standardization techniques (45) as was done in both NHANES II surveys (46). Another source of error in 24-h recalls is that it does not account for day-to-day variation on how an individual eats and therefore is a poor indicator of individual intake (36). However, 24-h recalls are considered valid for providing estimates of a population's intake (45, 47–49).

Both NHANES II and the US Department of Agriculture Nationwide Food Consumption Survey (1977–78) report caloric intake values 300–400 kcal lower than the maintenance recommended by the Food and Nutrition Board, a finding that has been discussed widely in the scientific literature (50, 51). All NHANES II 24-h recalls were collected for weekdays, which is one possible reason for the lower caloric intake. However, the issue of whether the lower reported energy intakes are real or merely reflect underreporting has not been resolved. If one considers the energy intake as underreported and assumes the fiber values are underestimated by the same proportion as calories, then this could account for an ~20% (2.2 g/d) underestimation of fiber intake. Of course, caloric intake does not have to be proportional to fiber intake. Beaton has reported significant higher intake of calories for females on weekends than weekdays but no difference in crude-fiber intake (52).

In comparing DF/1000 kcal with other published values for the United States, the results are similar (7) except for college students (8). In the sample of college students examined (8), the mean caloric intake for males was 2384 kcal and for females 1409 kcal compared with the much higher caloric intakes in NHANES II (2990 kcal for males and 1686 kcal for females). It is likely that the dietary patterns of these students (8) was quite different from the typical US adult pattern.

To see what types of diets were accounting for the low DF values in our data, a sample of 30 24-h recalls were examined for subjects whose dietary intake of calories, fat, and carbohydrate were near the median intake for these nutrients. These limitations were imposed to try to look for more typical diets. Most of the diets with 9 g DF/d were devoid of whole-grain products and contained two or fewer servings of vegetables and/or fruits. Those consuming ≥ 20 g DF/d had three or more servings of fruits and vegetables plus the addition of nuts and legumes and whole-grain cereals in their diets. The low DF intake found in this study is supported by consumption patterns of various food groups in NHANES II (G Patterson, B Block, unpublished observations). Patterson and Block found that, exclusive of potatoes and salads, only 0.65 servings of vegetables are consumed per person per day. Including potatoes and salads brought this to ~1.5 servings of vegetables consumed per day in the US population. The consumption of fruits per day is even lower, 0.68 servings per person per day and only 11% had more than one serving of fruit per day. If nuts, beans, and legumes are grouped, only 0.29 servings per person per day would be from this high-fiber group. Only 12% of the sample had whole-wheat bread and 7% had a high-fiber or granola cereal during the 24-h period of dietary recall in the NHANES II (53). Thus, the lower fiber values found in this study are due in part to the fact that actual American dietary patterns are far from ideal.

Increased consumption of fruits and vegetables and cereals also explains the rise in fiber intake per 1000 kcal in older age groups (Fig 2*A*). **Table 8** shows the contributions of the major food groups to caloric intake for different age groups. It is clear from this table that the increase in relative fiber intake seen in older ages is associated with the greater proportional intake of fruits and vegetables and cereals in the diet.

Because the values provided here are based on reports of actual consumption, they do not include the waste, peels, etc that are included in food supply and disappearance data (33, 34). For example, it was shown recently that the per capita supply of dietary fiber in Canada, 22–24 g/d, is ~50% greater than their national survey estimate (36). The average dietary fiber intake using Southgate values (28) from the Nutrition Canada Survey (1970–72) is 14.6 ± 9.8 g/d and 6.3 g/1000 kcal with ranges for the adult groups from 12.2–18.6 g/d and 5.5–8.0 g/1000 kcal (36), which are similar to our estimates.

This study demonstrates that DF intake in the United States may be lower than previous estimates. These data plus estimates of fiber intake for various subgroups within the US may contribute to our further understanding of the role of DF in decreasing the risk of colon cancer (53) and other chronic diseases (1–4).

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